COST ESTIMATING OVERVIEW

Agenda

- Methods
- Estimate Types
- Costs estimates during the life of project
- Key Cost Elements
- Factors that affect the Estimate
- Estimating Tools

COST ESTIMATING OVERVIEW
ESTIMATING METHODS

- Parametric Estimating
  - Parametric estimating can be defined as identifying major task cost drivers, applying associated relationships and/or factors to them to develop project costs.
  - Parametric estimating typically employs the use of parametric models.
    - A parametric cost model is a group of cost estimating relationships, used together to estimate an entire or several tasks
  - Primary Purpose:
    - Provide a defensible budget estimate at early stages with little known design criteria

COST ESTIMATING OVERVIEW
ESTIMATING METHODS

- Detailed Estimating
  - Detailed estimates are ‘bottoms-up’ made from very defined engineering data
  - Detailed quantity take-offs are developed to support labor, material and equipment prices
  - These estimates are the most comprehensive and are labor intensive to prepare

COST ESTIMATING OVERVIEW
TYPES OF ESTIMATES

- Types of Estimates:
  - Rough Order of Magnitude (ROM) Estimates
    - Made without detailed engineering
    - Accurate to within +50% or -30% of actual costs
  - Factor (Benchmark) Estimating
    - Utilizes costs from similar projects
    - Historical cost data is normalized and scaled to fit
  - Budget (Planning) Estimates
    - Based on preliminary or partial engineering data
    - Accurate to within +30% or -15% of actual costs
  - Detailed (Definitive) Estimates
    - Based on high level of design
    - Accurate within +20 or – 10% of actual costs

COST ESTIMATING OVERVIEW
TYPES OF ESTIMATES

- Rough Order of Magnitude (ROM) Estimates
  - Useful in:
    - Preliminary design-phase budget
    - Probable costs for program-level budgets
    - General economic feasibility
    - Preliminary economic screening of alternatives
    - Consequences of design decisions
- ROM estimates often use scaling, factoring, or parametric tools

COST ESTIMATING OVERVIEW
TYPES OF ESTIMATES

- Budget (Planning) Estimates
  - Useful in:
    - Accurate design-phase budgets
    - Program-level budgets
    - Detailed economic screening of alternatives
    - Updating existing ROM or Budget estimates with more detailed data

- Budget estimates typically use the same techniques as ROM estimating; however, the use of more detailed data increases the accuracy of the estimate.

COST ESTIMATING OVERVIEW
TYPES OF ESTIMATES

- Detailed (Definitive) Estimates
  - Useful in:
    - Independent Government Estimates (IGEs)
    - Cost validation/Contract negotiations – ensuring that project costs (i.e., charges from a contractor) are in line with what should have been charged

- Primary Purpose:
  - Evaluate contractor bids against the government estimates
  - Track costs throughout the project

COST ESTIMATING OVERVIEW
TYPES OF ESTIMATES

- Factor (Benchmark) Estimating
  - Useful in:
    - Cost comparisons for similar projects
    - Developing early budget requirements
    - Developing a quick detailed estimates
- Based on cost curves, ratios, and factoring historical data

COST ESTIMATING OVERVIEW
ESTIMATES DURING PROJECT LIFE

- Cost Estimating during the RI/FS stage:
  - Design still conceptual and estimates are considered conceptual
  - Cost engineer must make assumptions
  - Usually includes more contingencies
  - Estimate must include project's life cycle costs
  - Estimate considered to be conceptual
    - During the RI (screening of alternatives) estimate = -50% to 100%
    - During the FS (detailed analysis of alternatives/conceptual design) estimate = +50% to -30%

COST ESTIMATING OVERVIEW

ESTIMATES DURING PROJECT LIFE

- Record of Decision (ROD) Estimates
  - Cost estimate is developed during the FS for the preferred alternative
  - Not to used to establish budgets or negotiating Superfund enforcement
  - The subsequent estimates used for the ROD must reflect any changes

COST ESTIMATING OVERVIEW

ESTIMATES DURING PROJECT LIFE

- Cost Estimating during the Design stage:
  - Estimate based on detailed scope, design drawings, and specifications
  - Estimate built from the bottom up
  - Quotes obtained for major cost elements
  - Uses less contingencies, if any
  - Estimate used to evaluate contractor proposals

COST ESTIMATING OVERVIEW
KEY COST ELEMENTS

- Identifying Cost Elements of the estimate
  - Estimates should include as many cost elements as possible
  - Estimates for HTRW projects typically use a work breakdown structure (WBS) to identify cost elements
    - HTRW Remedial Action/Operation & Maintenance (RA/OM) WBS, Feb. 1996
    - Environmental Cost Elements Structure (ECES), Sept. 1999

COST ESTIMATING OVERVIEW
KEY COST ELEMENTS

- Key Elements of a HTRW Capital cost estimates
  - Mob and Demob
  - Monitoring, Sampling, Testing and Analysis
  - Site Work Items
  - Surface water collection or containment
  - Groundwater extraction or containment
  - Gas/vapor collection or control
  - Soil excavation
  - Sediments/sludge removal or containment
  - Demolition/removal
  - Caps or covers
  - On-site treatment
  - Off-site treatment or disposal
  - Contingencies

COST ESTIMATING OVERVIEW
KEY COST ELEMENTS

- Key Elements of a O&M estimate
  - Monitoring, Sampling, Testing, and Analysis
  - Extraction, Containment, or Treatment Systems
  - Off-site treatment/disposal
  - Contingencies
  - Professional/Technical Services
    - Project management
    - Technical support
  - Institutional Controls

COST ESTIMATING OVERVIEW

FACTORS AFFECTING ESTIMATES

- Characterization of Site
- Level of Design Detail
- Contract Type
- Escalation Cost/Inflation
- Bidding Climate
- Type of Work / Time of Year (Productivity)
- Labor Pool Area
- Specialty Equipment

COST ESTIMATING OVERVIEW

FACTORS AFFECTING ESTIMATES

- Characterization of Site
  - The more characterization the better the project will be defined.
  - Lessens the chance of running over budget
  - Creates definitive design options and technology selections

COST ESTIMATING OVERVIEW
FACTORS AFFECTING ESTIMATES

- Level of Design Detail
  - Detail design creates better and more accurate estimates
  - Easier to evaluate bid proposals against the government estimate
  - Lessen the chance of change orders during remediation
  - Aids in negotiations of project costs

COST ESTIMATING OVERVIEW

FACTORS AFFECTING ESTIMATES

- Contract Type
  - Estimates are prepared to the standards of the agency, & design requirements
  - Innovative contract types (design build) usually result in less detailed estimates
  - Innovating contract types may affect the accuracy of the estimate.

COST ESTIMATING OVERVIEW

FACTORS AFFECTING ESTIMATES

- Contingencies
  - An allowance included in estimates to cover unknowns that are not possible to adequately evaluate from available data but must be represented in the project estimate
- Design Contingencies (Project)
  - Represent project risks associated with incomplete design and are unforeseeable at the time of estimate preparation, which are likely to become known as project design proceeds.
- Construction Contingencies (Reserve)
  - Represent remedial action or O&M costs at the time of bid or final estimate preparation, which are likely to become known as project construction or O&M proceeds

COST ESTIMATING OVERVIEW

FACTORS AFFECTING ESTIMATES

- Escalation versus Inflation
  - Escalation
    - Reflects increases in historical prices to the present day
    - Calculated by multiplying historical prices by a ratio of indexes
  - Inflation
    - Addresses future growth in costs of goods and services
    - Calculated by applying a % factor to current $$ estimate

COST ESTIMATING OVERVIEW
FACTORS AFFECTING ESTIMATES

- Bidding Climate
  - Usually considered when developing a detailed estimate for competitive bid projects.
  - Things that affect the bidding climate are:
    - Size and type of project
    - How busy the contractors are in the area
    - Economy of the area
    - Time of year
    - Location

COST ESTIMATING OVERVIEW
FACTORS AFFECTING ESTIMATES

- Type of Work / Time of Year
  - Limits the number of contractors
  - Affects the Productivity
  - May cause extra material and overhead costs and other extraneous costs

COST ESTIMATING OVERVIEW
FACTORS AFFECTING ESTIMATES

- Labor Pool
  - Limited labor pool will cause an increase in contractors proposals
  - Things that affect labor pools
    - Amount of work in the area
    - Type or difficulty of project (radiation type work, ordnance and explosive type work, chemical treatment, etc.)

COST ESTIMATING OVERVIEW
FACTORS AFFECTING ESTIMATES

- Specialty Equipment
  - Increase the cost of the project
  - Equipment is not always listed in over the counter equipment manuals
  - Prices usually obtained from vendor quotes or applying modifying factors to normal equipment prices

COST ESTIMATING OVERVIEW
ESTIMATING TOOLS

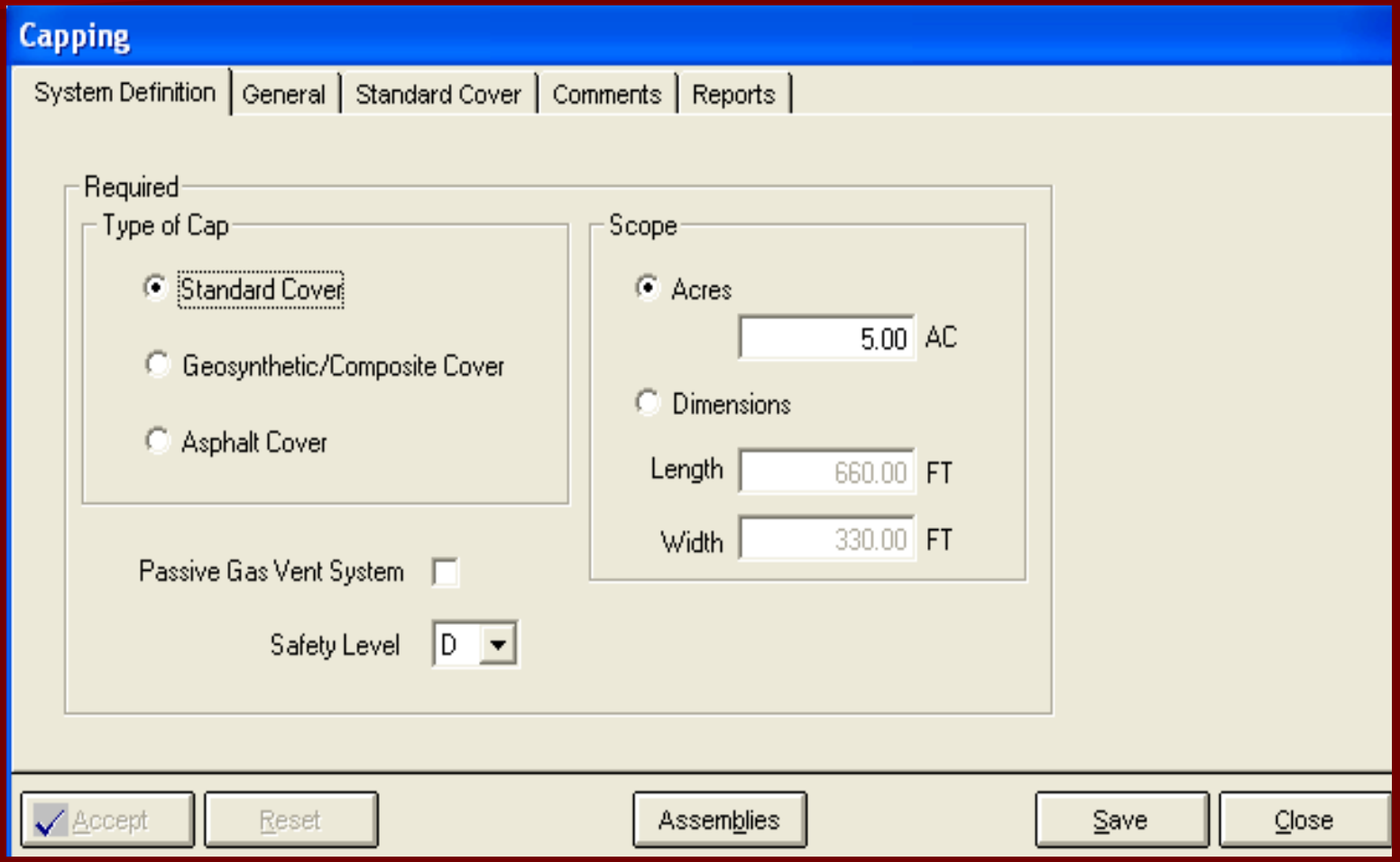
- Remedial Action Cost Engineering and Requirements (*RACER*) system is a parametric cost-estimating tool that accurately estimates costs for all phases of remediation:
  - Pre-Study
  - Study
  - Design
  - Removal/Interim Action
  - Remedial Action
  - Operations and Maintenance
  - Long Term Monitoring
  - Site Close-out

COST ESTIMATING OVERVIEW
ESTIMATING TOOLS

- How Does the RACER Estimating Methodology Work?
  - Uses parametric cost modeling
  - Models based on generic engineering solutions for environmental projects, technologies, and processes
  - User inputs parameters into the model to generate the cost estimate

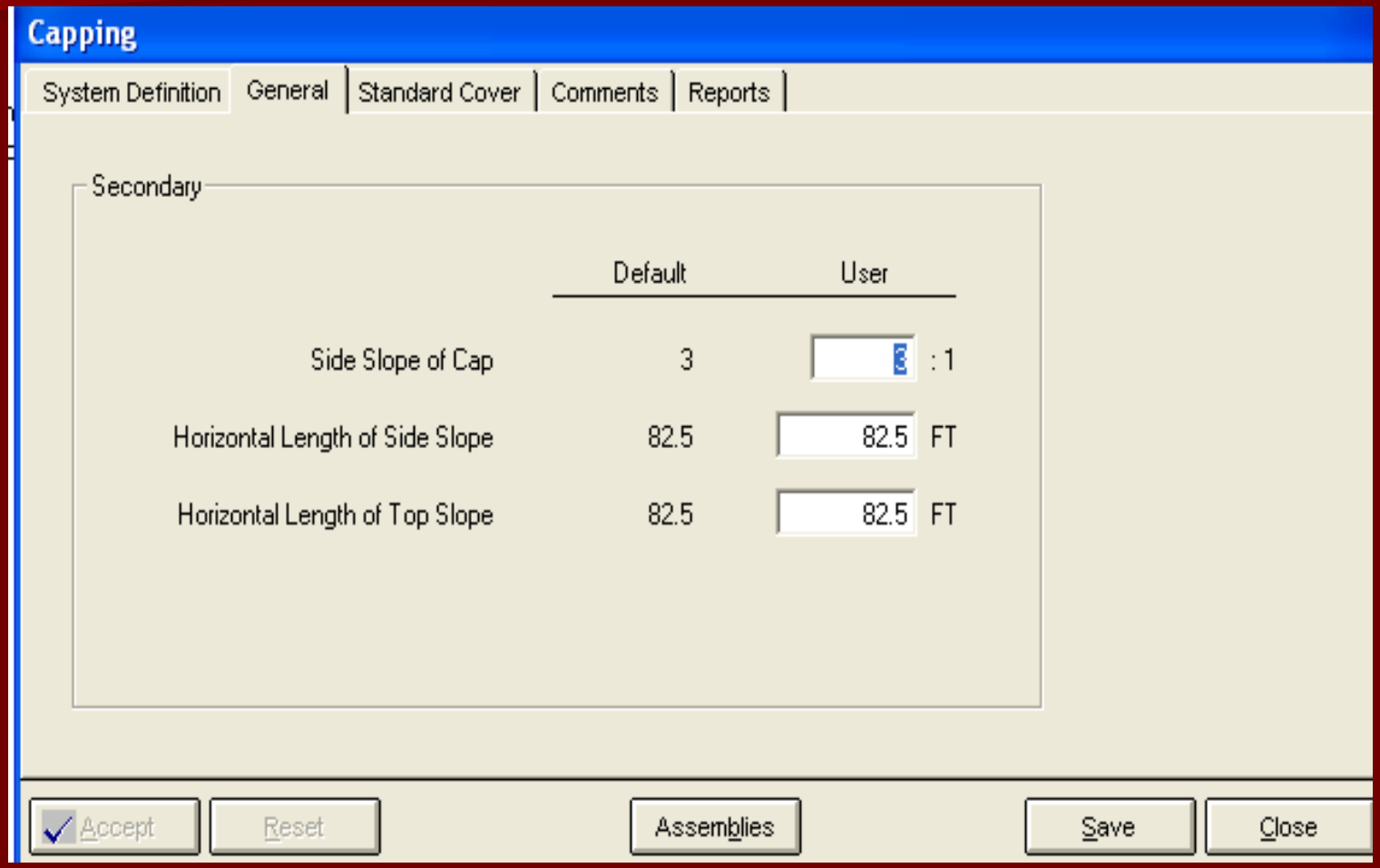
COST ESTIMATING OVERVIEW

ESTIMATING TOOLS



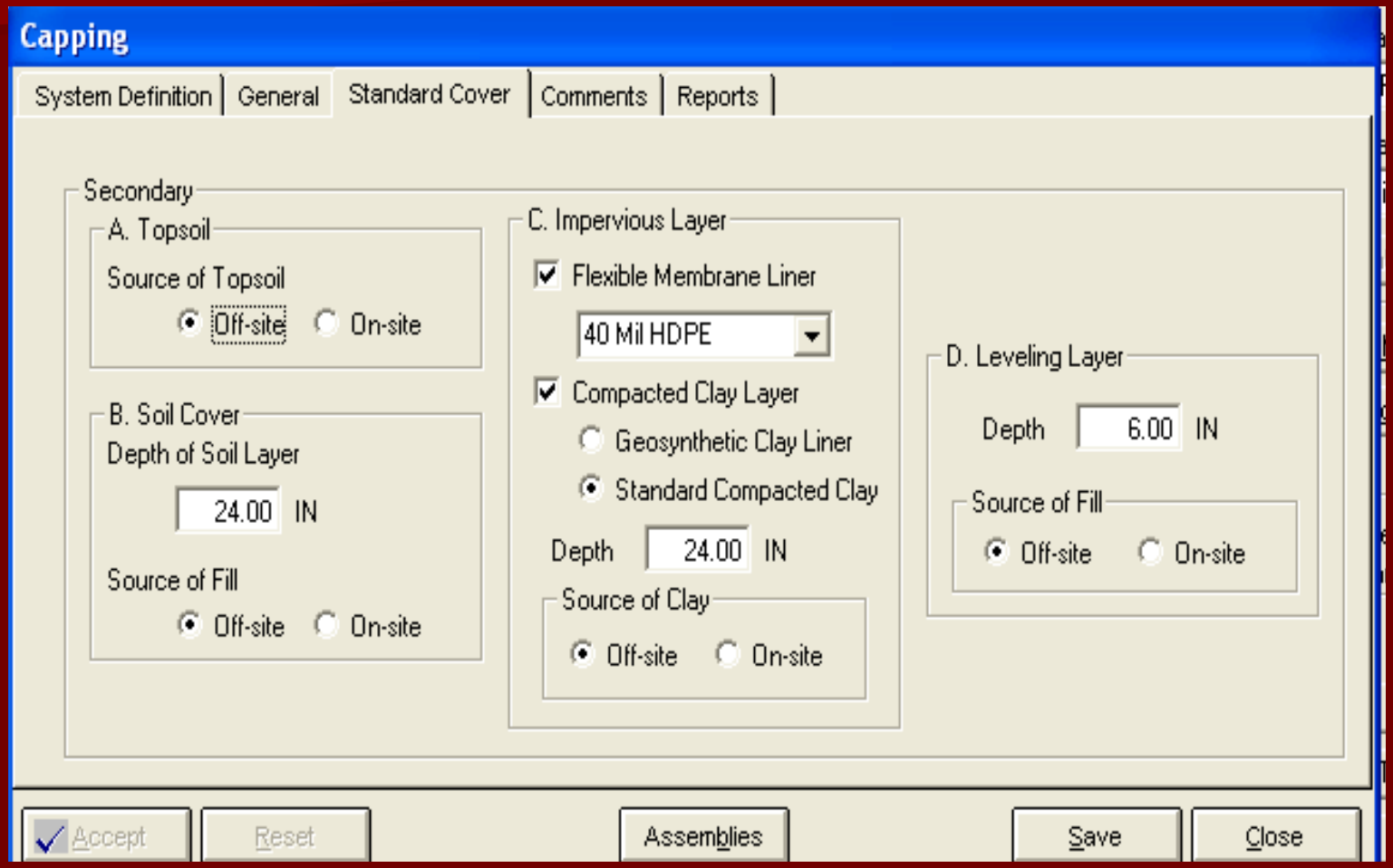
COST ESTIMATING OVERVIEW

ESTIMATING TOOLS



COST ESTIMATING OVERVIEW

ESTIMATING TOOLS



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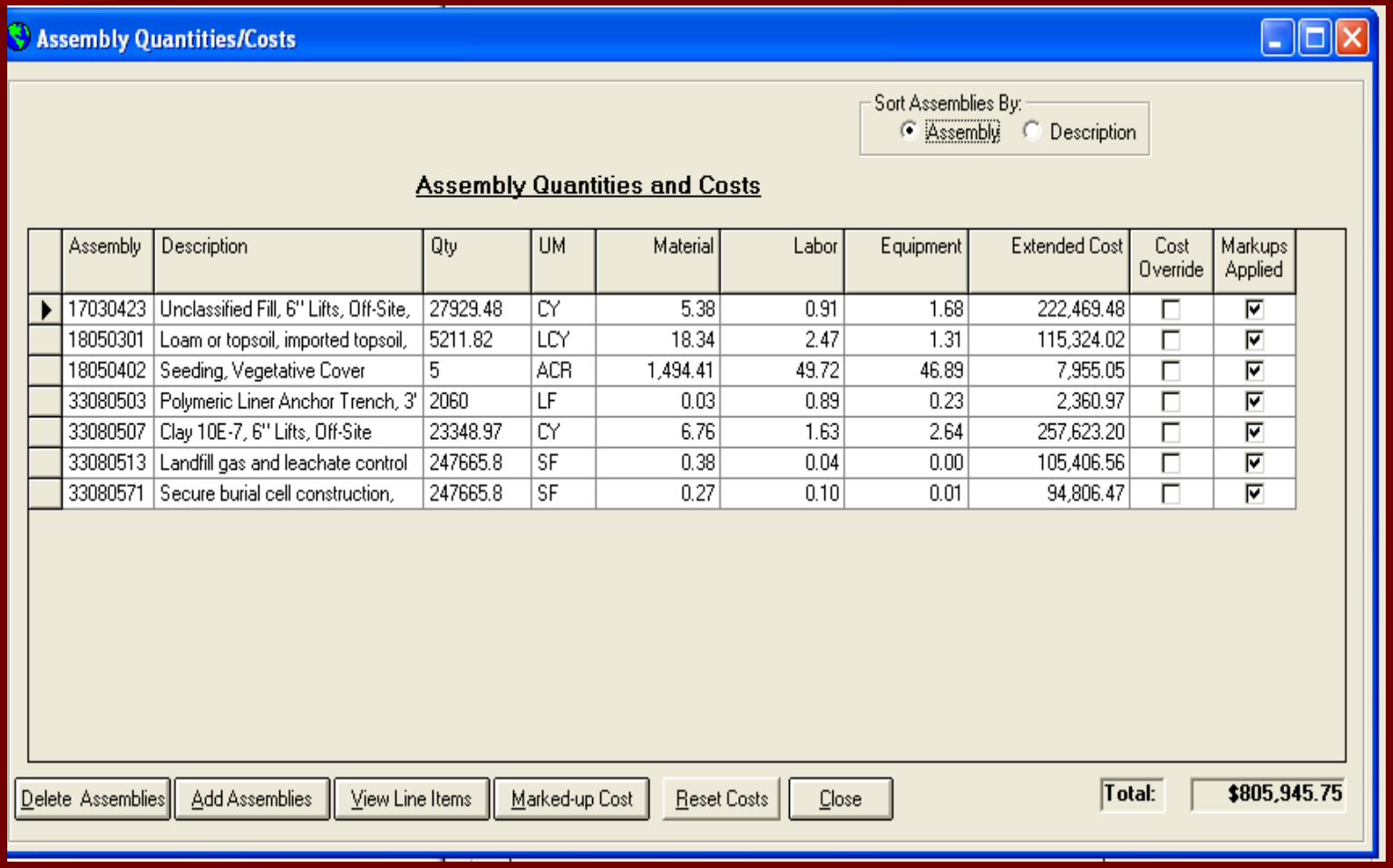
ESTIMATING TOOLS

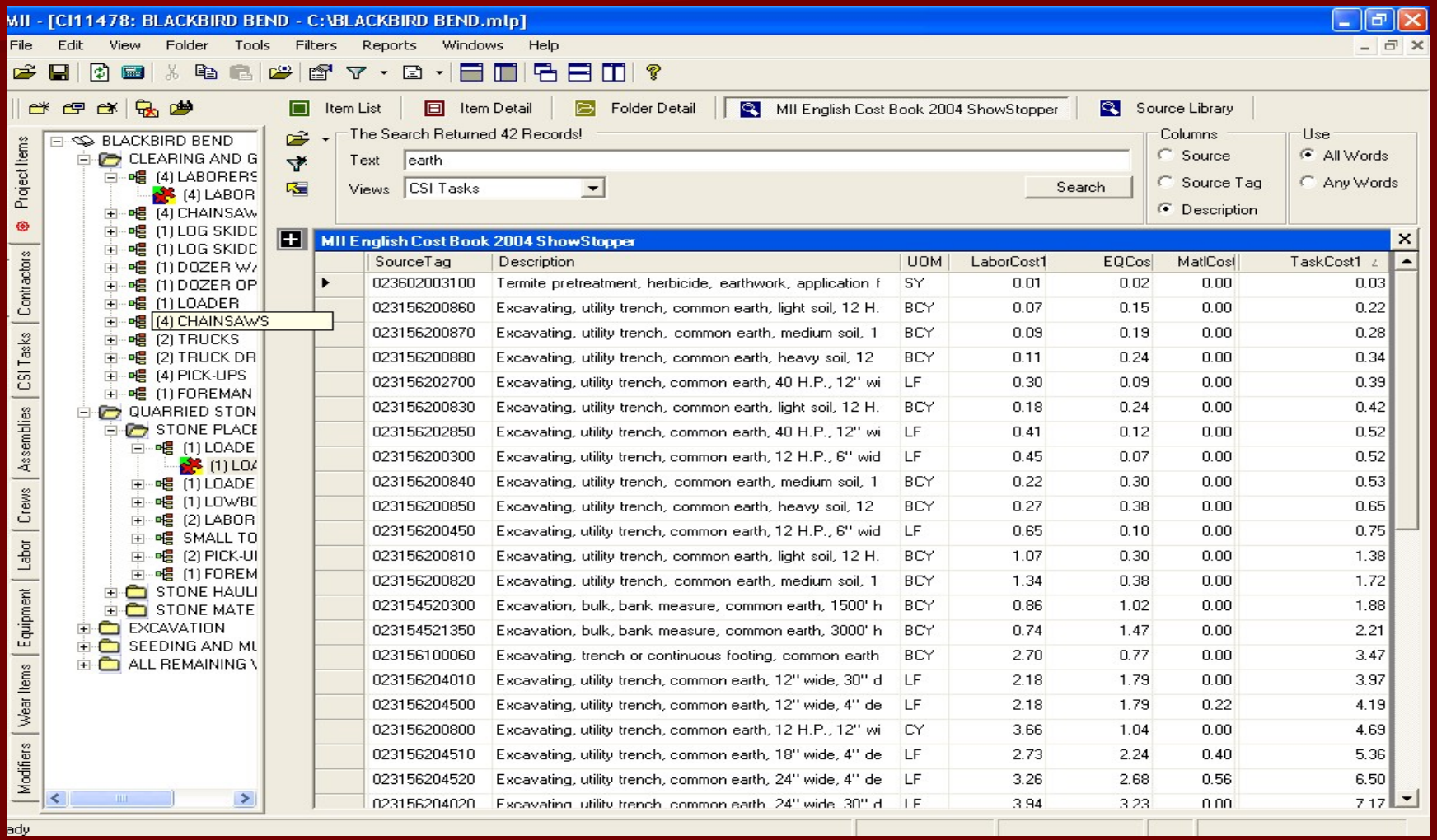

Assembly Quantities/Costs
Sort Assemblies By:
Assembly
Description
Assembly Quantities and Costs
Assembly | Description | Qty | UM | Material | Labor | Equipment | Extended Cost | Cost Override | Markups Applied
17030423 | Unclassified Fill, 6" Lifts, Off-Site, | 27929.48 | CY | 5.38 | 0.91 | 1.68 | 222,469.48
18050301 | Loam or topsoil, imported topsoil, | 5211.82 | LCY | 18.34 | 2.47 | 1.31 | 115,324.02
18050402 | Seeding, Vegetative Cover | 5 | ACR | 1,494.41 | 49.72 | 46.89 | 7,955.05
33080503 | Polymeric Liner Anchor Trench, 3' | 2060 | LF | 0.03 | 0.89 | 0.23 | 2,360.97
33080507 | Clay 10E-7, 6" Lifts, Off-Site | 23348.97 | CY | 6.76 | 1.63 | 2.64 | 257,623.20
33080513 | Landfill gas and leachate control | 247665.8 | SF | 0.38 | 0.04 | 0.00 | 105,406.56
33080571 | Secure burial cell construction, | 247665.8 | SF | 0.27 | 0.10 | 0.01 | 94,806.47
Delete Assemblies
Add Assemblies
View Line Items
Marked-up Cost
Reset Costs
Close
Total:
$805,945.75

COST ESTIMATING OVERVIEW
ESTIMATING TOOLS

- MII (formerly known as MCACES)
  - Detailed cost estimating software
  - Used by the Corps of Engineers for developing bottoms up estimates for IGE's
  - Prices based on a government maintain unit price book , labor, and equipment books

COST ESTIMATING OVERVIEW

ESTIMATING TOOLS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Item List
Item Detail
Folder Detail
MII English Cost Book 2004 ShowStopper
Source Library
The Search Returned 42 Records!
Text earth
Views CSI Tasks
Search
Columns
Source
Source Tag
Description
Use
All Words
Any Words
BLACKBIRD BEND
CLEARING AND G
(4) LABORERS
(4) LABOR
(4) CHAINSAW
(1) LOG SKIDD
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(1) LOADER
(4) CHAINSAWS
(2) TRUCKS
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(4) PICK-UPS
(1) FOREMAN
QUARRIED STON
STONE PLACE
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(1) LOADE
(1) LOWBC
(2) LABOR
SMALL TO
(2) PICK-UI
(1) FOREM
STONE HAULI
STONE MATE
EXCAVATION
SEEDING AND MU
ALL REMAINING
Project Items
Contractors
CSI Tasks
Assemblies
Crews
Labor
Equipment
Wear Items
Modifiers
MII English Cost Book 2004 ShowStopper
SourceTag Description UOM LaborCost1 EQCos MatlCost TaskCost1
023602003100 Termite pretreatment, herbicide, earthwork, application f SY 0.01 0.02 0.00 0.03
023156200860 Excavating, utility trench, common earth, light soil, 12 H. BCY 0.07 0.15 0.00 0.22
023156200870 Excavating, utility trench, common earth, medium soil, 1 BCY 0.09 0.19 0.00 0.28
023156200880 Excavating, utility trench, common earth, heavy soil, 12 BCY 0.11 0.24 0.00 0.34
023156202700 Excavating, utility trench, common earth, 40 H.P., 12" wi LF 0.30 0.09 0.00 0.39
023156200830 Excavating, utility trench, common earth, light soil, 12 H. BCY 0.18 0.24 0.00 0.42
023156202850 Excavating, utility trench, common earth, 40 H.P., 12" wi LF 0.41 0.12 0.00 0.52
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023156200850 Excavating, utility trench, common earth, heavy soil, 12 BCY 0.27 0.38 0.00 0.65
023156200450 Excavating, utility trench, common earth, 12 H.P., 6" wid LF 0.65 0.10 0.00 0.75
023156200810 Excavating, utility trench, common earth, light soil, 12 H. BCY 1.07 0.30 0.00 1.38
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023154521350 Excavation, bulk, bank measure, common earth, 3000' h BCY 0.74 1.47 0.00 2.21
023156100060 Excavating, trench or continuous footing, common earth BCY 2.70 0.77 0.00 3.47
023156204010 Excavating, utility trench, common earth, 12" wide, 30" d LF 2.18 1.79 0.00 3.97
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023156204020 Excavating, utility trench, common earth, 24" wide, 30" d LF 3.94 3.23 0.00 7.17
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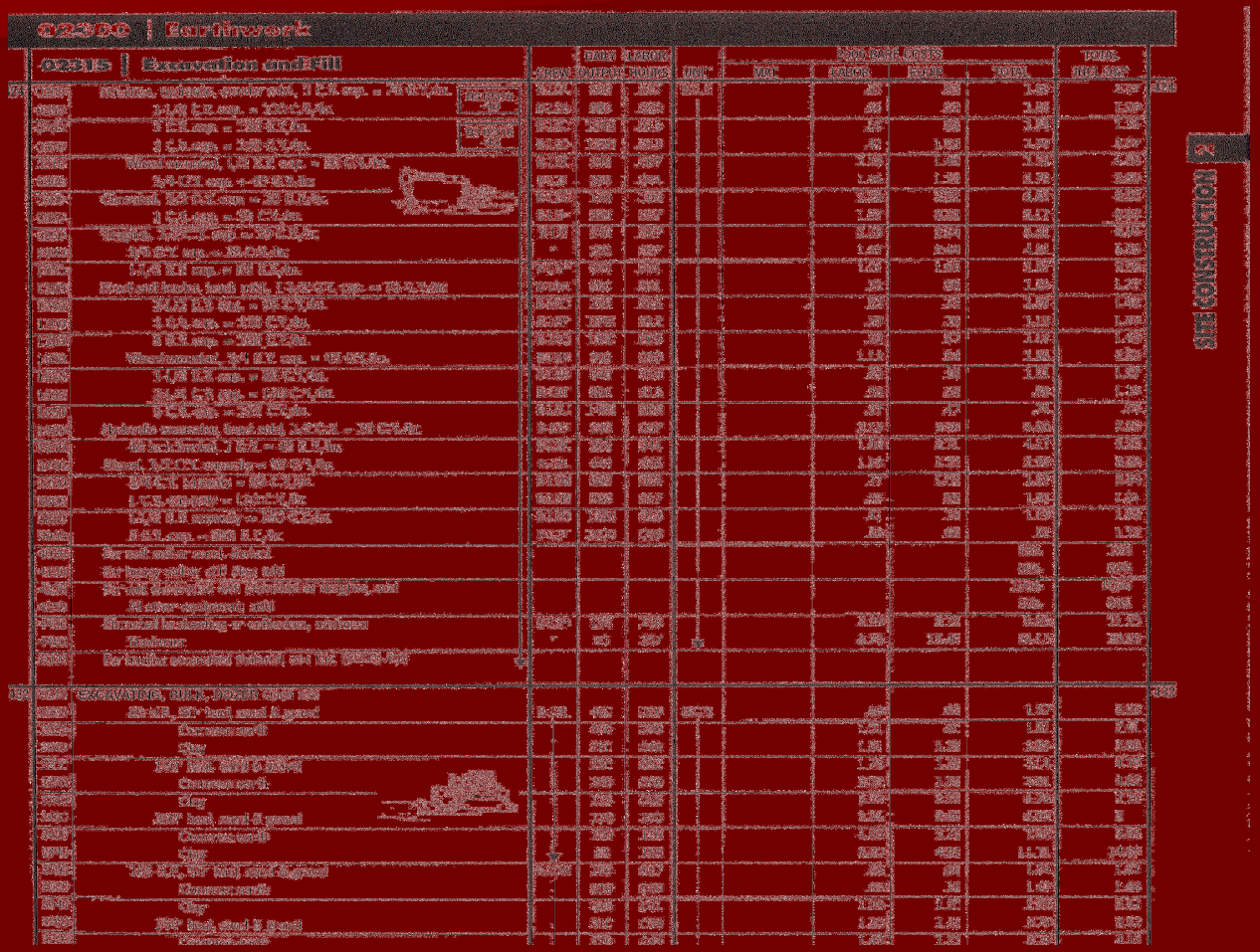
COST ESTIMATING OVERVIEW
ESTIMATING TOOLS

- MEANS
  - Commercially available cost database
  - Contains line items with labor, equipment, and material pricing
  - Also contains information on
    - Equip Rental costs
    - Crews
    - Historical Cost Indexes
    - City cost Indexes
    - Location factors
  - Used to develop detailed costs estimates

COST ESTIMATING OVERVIEW

ESTIMATING TOOLS



COST ESTIMATING OVERVIEW
ESTIMATING TOOLS

- Cost Risk
  - Analytical tool for analyzing financial risk to determine the contingencies
  - Works with RACER, stand alone estimate within Cost Risk, spreadsheet estimates
  - Uses Crystal Ball to run the cost risk analysis

RPM RA Management Role

- RPM is responsible for understanding and monitoring
  - technical scope
  - project budget
  - project schedule
- RPM should anticipate and identify potential problems early, before they become a crisis
- RPM should involve appropriate level of management/expertise to resolve problems

Potential Problem Analysis (PPA) (risk analysis)

- Risk - Existing variation in the possible outcomes associated with project circumstances
  - Risk is a property of an entire probability distribution and each component of project outcome has a separate probability
  - Risk and probability have objective and subjective interpretations
- Uncertainty - Conscious awareness of risk related to project circumstances

PPA - Continued

- Remedial action risks
  - construction related
  - physical
  - contractual & legal
  - performance
  - economic
  - political & public

PPA - Continued

- When should PPA be conducted?
  - During project delivery analysis/pre-design
  - Procurement planning
  - Construction mobilization/partnering
  - Periodically during project
- Who should be engaged?
  - Involve your whole project management team

COST ESTIMATING OVERVIEW SAMPLE PROJECT

- SHOW A SAMPLE WITH THE ELEMENTS